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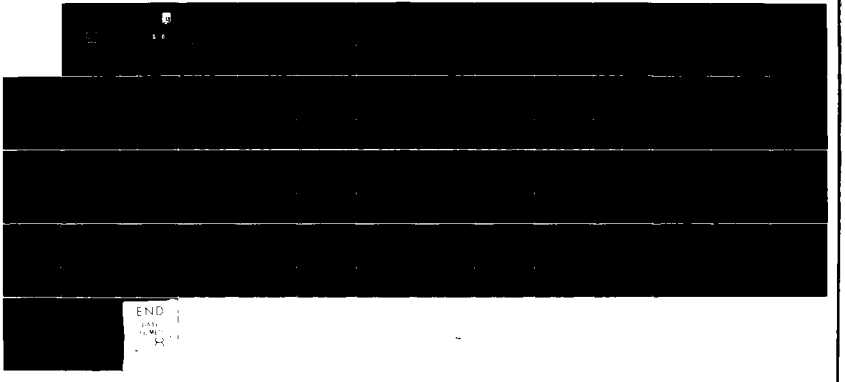

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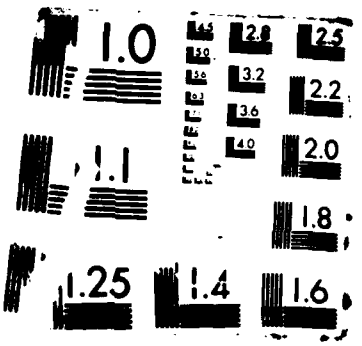
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AFWAL-TR-86-4006
Volume V
Part 18

INTEGRATED INFORMATION SUPPORT SYSTEM (IISS)
Volume V - Common Data Model Subsystem
Part 18 - NDML Precompiler Generate Conceptual Schema to External Schema Transform Product Specification

General Electric Company
Production Resources Consulting
One River Road
Schenectady, New York 12345

Final Report for Period 22 September 1980 - 31 July 1985

November 1985

Approved for public release; distribution is unlimited.

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AIR FORCE WRIGHT AERONAUTICAL LABORATORIES
AIR FORCE SYSTEMS COMMAND
WRIGHT-PATTERSON AFB, OH 45433-6533

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The computer software contained herein are theoretical and/or references that in no way reflect Air Force-owned or -developed computer software.

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FIELD	GROUP	SUB GR
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18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

This document is the product specification establishing the design implementation of the IISS Configuration Item PRE8 which will generate software to convert or transfer retrieved data from conceptual to external terms.

→ See p 1-1

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Integrated Information Support System (IISS)
Vol V - Common Data Model Subsystem
Part 18 - NDML Precompiler Generate Conceptual Schema
to External Schema Transform Product
Specification

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17 Jul 1986

PREFACE

This product specification covers the work performed under Air Force Contract F33615-80-C-5155 (ICAM Project 6201). This contract is sponsored by the Materials Laboratory, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio. It was administered under the technical direction of Mr. Gerald C. Shumaker, ICAM Program Manager, Manufacturing Technology Division, through Project Manager, Mr. David Judson. The Prime Contractor was Production Resources Consulting of the General Electric Company, Schenectady, New York, under the direction of Mr. Alan Rubenstein. The General Electric Project Manager was Mr. Myron Hurlbut of Industrial Automation Systems Department, Albany, New York.

Certain work aimed at improving Test Bed Technology has been performed by other contracts with Project 6201 performing integrating functions. This work consisted of enhancements to Test Bed software and establishment and operation of Test Bed hardware and communications for developers and other users. Documentation relating to the Test Bed from all of these contractors and projects have been integrated under Project 6201 for publication and treatment as an integrated set of documents. The particular contributors to each document are noted on the Report Documentation Page (DD1473). A listing and description of the entire project documentation system and how they are related is contained in document FTR620100001, Project Overview.

The subcontractors and their contributing activities were as follows:

TASK 4.2

Subcontractors	Role
Boeing Military Aircraft Company (BMAC)	Reviewer.
D. Appleton Company (DACOM)	Responsible for IDEF support, state-of-the-art literature search.
General Dynamics/ Ft. Worth	Responsible for factory view function and information models.

Subcontractors	Role
Illinois Institute of Technology	Responsible for factory view function research (IITRI) and information models of small and medium-size business.
North American Rockwell	Reviewer.
Northrop Corporation	Responsible for factory view function and information models.
Pritsker and Associates	Responsible for IDEF2 support.
SofTech	Responsible for IDEF0 support.

TASKS 4.3 - 4.9 (TEST BED)

Subcontractors	Role
Boeing Military Aircraft Company (BMAC)	Responsible for consultation on applications of the technology and on IBM computer technology.
Computer Technology Associates (CTA)	Assisted in the areas of communications systems, system design and integration methodology, and design of the Network Transaction Manager.
Control Data Corporation (CDC)	Responsible for the Common Data Model (CDM) implementation and part of the CDM design (shared with DACOM).
D. Appleton Company (DACOM)	Responsible for the overall CDM Subsystem design integration and test plan, as well as part of the design of the CDM (shared with CDC). DACOM also developed the Integration Methodology and did the schema mappings for the Application Subsystems.

Subcontractors	Role
Digital Equipment Corporation (DEC)	Consulting and support of the performance testing and on DEC software and computer systems operation.
McDonnell Douglas Automation Company (McAuto)	Responsible for the support and enhancements to the Network Transaction Manager Subsystem during 1984/1985 period.
On-Line Software International (OSI)	Responsible for programming the Communications Subsystem on the IBM and for consulting on the IBM.
Rath and Strong Systems Products (RSSP) (In 1985 became McCormack & Dodge)	Responsible for assistance in the implementation and use of the MRP II package (PIOS) that they supplied.
SofTech, Inc.	Responsible for the design and implementation of the Network Transaction Manager (NTM) in 1981/1984 period.
Software Performance Engineering (SPE)	Responsible for directing the work on performance evaluation and analysis.
Structural Dynamics Research Corporation (SDRC)	Responsible for the User Interface and Virtual Terminal Interface Subsystems.

Other prime contractors under other projects who have contributed to Test Bed Technology, their contributing activities and responsible projects are as follows:

Contractors	ICAM Project	Contributing Activities
Boeing Military Aircraft Company (BMAC)	1701, 2201, 2202	Enhancements for IBM node use. Technology Transfer to Integrated Sheet Metal Center (ISMC).

Contractors	ICAM Project	Contributing Activities
Control Data Corporation (CDC)	1502, 1701	IISS enhancements to Common Data Model Processor (CDMP).
D. Appleton Company (DACOM)	1502	IISS enhancements to Integration Methodology.
General Electric	1502	Operation of the Test Bed and communications equipment.
Hughes Aircraft Company (HAC)	1701	Test Bed enhancements.
Structural Dynamics Research Corporation (SDRC)	1502, 1701, 1703	IISS enhancements to User Interface/Virtual Terminal Interface (UI/VTI).
Systran	1502	Test Bed enhancements. Operation of Test Bed.

TABLE OF CONTENTS

SECTION 1

SCOPE

1.1 Identification

This specification establishes the design of Function PRE8, "Transform CS/ES", one of the major functions of the Configuration Item "Precompiler" to be built and formally accepted by the ICAM Program Office. This CI constitutes one of the subsystems of the Common Data Model Processor (CDMP).

1.2 Functional Summary

The purpose of this Computer Program Configuration Item (CPCI) is to generate source code which at runtime will transform the aggregated conceptual format results to the required external schema format.

The following function will be performed by this CPCI:

1. Generate a COBOL program with its four major divisions.

2. Generate working storage to contain variables to perform the necessary arithmetic functions; namely, minimum maximum, count, sum, average or mean.

3. Generate files to perform the necessary "ORDER BY" and "DISTINCT" clauses.

4. Generate Procedure Division statements to move the conceptual format results to an external format variables.

5. Perform the user specified arithmetic function on the external schema results, and the sorting and sequencing necessary to produce the "ORDER BY" and "DISTINCT" results.

SECTION 2

DOCUMENTS

2.1 Reference Documents

1. ICAM Documentation Standards: IDS15012000A, 28 December 1981.

2. D. Appleton Co., CDM Administrators Manual: UM620141000, March, 1984.

3. D. Appleton Co., CDM1-IDEF, Model of the Common Data Model: CCS620141000, 15 May, 1985.

4. D. Appleton Co., Computer Program Development Specification (DS) for ICAM Integrated Support System, (IISS) Configuration Item: NDML Precompiler: DS620141200, October, 1984.

5. D. Appleton Co., Embedded NDML Programmer's Reference Manual: PRM620141200, March, 1985.

6. Softech, Inc., NTM Programmer's Guide: UM620140001, July, 1984.

7. Control Data Corp., Computer Program Development Specification (DS) for ICAM Integrated Support System (IISS) Configuration Item: NDDL Command Processor: DS620141100, June 1985.

2.2 Terms and Abbreviations

Attribute Use Class: (AUC)

Conceptual Schema: (CS)

Common Data Model Processor: (CDMP)

Common Data Model: (CDM) Describes common data application process formats, form definitions, etc, of the IISS and includes conceptual schema, external, internal schemas, and schema transformation operators.

Data Field: (DF) An element of data in the external schema. It is by this name that an NDML programmer references

data.

Database Management System: (DBMS)

Distributed Request Supervisor: (DRS) This IISS CDM subsystem configuration item controls the execution of distributed NDML queries and non distributed updates.

Domain: A logical definition of legal attribute class values.

Domain Constraint: Predicate that applies to a single domain.

External Schema: (ES)

Forms: Structured views which may be imposed on windows or other forms. A form is composed of fields where each field is a form, item, or window.

Forms Processor: (FP) A set of callable execution time routines available to an application program for form processing.

Internal Schema: (IS)

Integrated Information Support System: (IISS) A test computing environment used to investigate, demonstrate and test the concepts of information management and information integration in the context of Aerospace Manufacturing. The IISS addresses the problems of integration of data resident on heterogeneous databases supported by heterogeneous computers interconnected via a local Area Network.

Mapping: The correspondence of independent objects in two schemas: ES to CS or CS to IS.

Network Transaction Manager: (NTM) Performs the coordination, communication and housekeeping functions required to integrate the application processes and system services resident on the various hosts into a cohesive system.

Neutral Data Manipulation Language: (NDML) A language developed by the IISS project to provide uniform access to common data, regardless of database manager or distribution criteria. It provides distributed retrieved and single node updates.

ORACLE: Relational DBMS based on the SQL (Structured Query Language, a product of ORACLE Corp, Menlo Park, CA). The CDM is an ORACLE database.

Parcel: A sequential file containing sections of source code of the input Application.

Request Processor: (RP) A COBOL program that will satisfy a retrieval or update NDML subtransaction against a particular Database Management System.

User Interface: (UI) Controls the user's terminal and interfaces with the rest of the system.

Virtual Terminal Interface: (VTI) Performs the interfacing between different terminals and the UI. This is done by defining a specific set of terminal features and protocols which must be supported by UI software which constitutes the Virtual Terminal Definition. Specific terminals are then mapped against the Virtual Terminal software by specific software modules written for each type of real terminal supported.

SECTION 3

REQUIREMENTS

3.1 Structural Description

The graphic portrayal of this CPCI is included in Section 3.10. This chart shows the hierarchical relationship of each module making up this CPCI.

This CPCI uses a lower level module to handle specific operations. Generating the external schema record definition based on the attributes resident in the External Schema Action List (CDP8A) is an example of this type of operation.

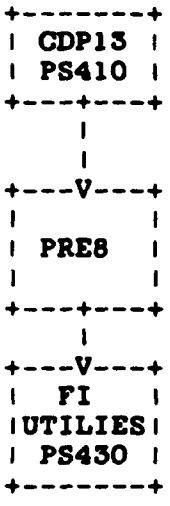
3.2 Functional Flow

This CPCI implemented the logic defined in the Development Specification for this CPCI. Details of inputs/outputs and relationships between modules are found in Section 3.10.

This CPCI has been designated to operate in a batch or interactive mode. It must operate in the system environment established for IISS; that is, the Network Transaction Manager. It currently can only be executed on the DEC VAX due to the dependence on the VAX sort although this can be changed for execution on the IBM.

3.3 Interfaces

The following depicts the interface of PRE8 with other CPCI's in the system.



3.3.1 Inputs/Outputs

The following depicts the inputs and outputs of this CPCI. A detail description for each item can be found in the DS for this CPCI.

FUNCTION: PRE8

INPUT	OUTPUT
Target-Host	Module Status
Current-Host	
Module-Name	
External Schema Action List	
Conceptual Schema Action List	
Conceptual to External Work List	
User View Abbreviation List	
ORACLE Log on Data Area	
Error File	
Generated File Name	

3.4 Program Interrupts

Not applicable to the CPCI.

3.5 Timing and Sequencing Description

This CPCI is called for each NDML Query statement to transform the results from conceptual to external.

3.6 Special Control Features

Not applicable to this CPCI.

3.7 Storage Allocation

3.7.1 Database Definition

The database used by this CPCI is the Common Data Model (CDM) database. The model is defined by the CDM1, the IDEF-1 Model of the CDM, Reference Number 3.

3.7.1.1 File Description

No permanent files have been defined for this CPCI. It may use temporary scratch files for such things as input and results.

3.7.1.2 Table Description

All tables used by this CPCI have been defined by the Development Specification for this CPCI.

3.7.1.3 Item Description

Not applicable to this CPCI.

3.8 Object Code Creation

The Object Code for this CPCI will be created by the system integration team using defined IISS Software Configuration Management procedures. This CPCI will use the COBOL management procedures and the COBOL language compiler.

3.9 Adaptation Data

This CPCI has been using ANSI COBOL language. The intent was to provide a transportable system. Any system environment supporting this language, a virtual memory management schema, the COMM and NTM subsystems of IISS and the ORACLE Database Management System should be able to support this CPCI. Every possible attempt has been to localizing and identifying any machine or environment dependent modules through the original design of the IISS and application of Configuration Management Procedures.

3.10 Detail Design Description

The following sections have been computer generated for this CPCI.

3.10.1 Main Program List

The following is a list of all "Main Programs" which are modules that are not called by any other module being documented here. These modules are either program entry points or, if they are hooked into another set of programs via subroutine calls, they are the points the external programs can call and therefore enter through. To differentiate between the two types of entry points, look at the individual Module Documentation (section 3.10.8) and look at Module Type for each of the Main Program modules listed. Note whether the routine is a Program, Subroutine, or Function. If it is a Program, it is truly a main program entry point. If not, then it is merely called by other programs not being documented here.

GENERATE CS TO ES TRANSFORM Main Program List

Module Name	Purpose
CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM

3.10.2 Module List

The following is a list of all the modules being documented here along with their purpose. Each module has a unique name, no matter what language it was written in.

GENERATE CS TO ES TRANSFORM Module List

Module Name	Purpose
CDP8A	GENERATE THE EXTERNAL SCHEMA RECORD DEFINITION
CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM

3.10.3 External Routines List

The following is a list of all routines or functions not documented here that are called by modules that are documented here. The first caller, in alphabetical order, is listed as well. The specification in which any module is documented may be found in the Module Documentation Index (Document Number CM 620100001). See section 3.10.6 for a list of the modules that call each of these external routines.

GENERATE CS TO ES TRANSFORM External Routines List

Module Name	First User
CDMACR	CDPRE8
CDPIC	CDPRE8
ERRPRO	CDPRE8
GENFIL	CDPRE8
OBINDN	CDPRE8
OCLOSE	CDPRE8
ODFINN	CDPRE8
OEXEC	CDPRE8
OFETCH	CDPRE8
OOPEN	CDPRE8
OSQL3	CDPRE8
RPTERR	CDPRE8

3.10.4 Include File List

The following is a list of all include files called in by modules being documented here. Each include file has a unique name regardless of the language being used. The purpose of each include file is listed as well. A more complete description of each include file is given in section 3.10.9. The purpose listed is the one that is in the source code of the include file.

A purpose of "**** PURPOSE NOT FOUND BY STRIPPER ****" indicates that a purpose statement was not written into the include file itself. The most common reason for this is that the include file comes from system libraries that were not developed by the project, such as 'C' libraries that are provided with the 'C' compiler.

See section 3.10.6 for a set of lists which show all the modules which call in each of these include files.

GENERATE CS TO ES TRANSFORM Include File List

File Name	Purpose
CEWORK	CS TO ES WORK LIST INFORMATION
CHKCDM	IISS CDMP CHECK STATUS CODES
CSAL	CONCEPTUAL SCHEMA ACTION LIST
ERRCDM	IISS ERROR STATUS CODES FOR CDMP MODULES
ERRPRO	PROCESS ERROR INCLUDE FILE
ESAL	EXTERNAL SCHEMA ACTION LIST
ESREC	WS DEFINTION FOR COBOL SOURCE LINE
MACDAT	WS VARIABLES FOR MACRO COPY UTILITY
ORCLEDA	WS DEFINITION FOR THE ORACLE LOGIN AREA
SBSTLST	WS DEFINITION FOR THE SUBSTITUTION LIST TABLE
UVABBR	USER VIEW ABBREVIATION LIST

3.10.5 Where Include File Used List

The following lists each include file from 3.10.4 and all the modules documented in this specification which include them. The purpose of each module is listed as well.

GENERATE CS TO ES TRANSFORM Where-include-file-used List

Include File	Module Name	Module Purpose
CEWORK		
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM
CHKCDM		
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM
CSAL		
	CDP8A	GENERATE THE EXTERNAL SCHEMA RECORD DEFINITION
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM
ERRCDM		
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM
ERRPRO		
	CDP8A	GENERATE THE EXTERNAL SCHEMA RECORD DEFINITION
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM
ESAL		
	CDP8A	GENERATE THE EXTERNAL SCHEMA RECORD DEFINITION
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM

GENERATE CS TO ES TRANSFORM Where-include-file-used List

Include File	Module Name	Module Purpose
ESREC		
	CDP8A	GENERATE THE EXTERNAL SCHEMA RECORD DEFINITION
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM
MACDAT		
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM
ORCLEDA		
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM
SBSTLST		
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM
UVABBR		
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM

3.10.6 Where External Routine Used List

The following lists each external function or routine listed in 3.10.3 and all the documented modules which call it. The purpose of each module is listed as well.

GENERATE CS TO ES TRANSFORM Where-external-routine-used List

System Module	Module Name	Module Purpose
CDMACR		
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM
CDPIC		
	CDP8A	GENERATE THE EXTERNAL SCHEMA RECORD DEFINITION
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM
ERRPRO		
	CDP8A	GENERATE THE EXTERNAL SCHEMA RECORD DEFINITION
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM
GENFIL		
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM
OBINDN		
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM
OCLOSE		
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM
ODFINN		
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM
OEXEC		

GENERATE CS TO ES TRANSFORM Where-external-routine-used List

System Module	Module Name	Module Purpose
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM
OFETCH		
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM
OOPEN		
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM
OSQL3		
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM
RPTERR		
	CDPRE8	GENERATE CS/ES TRANSFORM PROGRAM

3.10.7 Main Program Parts List

The following lists each Main Program listed in 3.10.1 and all the modules which are called either by that module itself or by any of the documented modules which it calls. It is possible for a non-main module to be listed more that once if it is called by multiple modules. The called modules, in this case known as program parts, are marked as to whether they are documented here. If so, the phrase "well-defined module" appears by the module name, if not it is an "external "routine". The Purpose of the Main Program module is listed as well.

GENERATE CS TO ES TRANSFORM Main Program Parts List

Main Pgm Name	Module Name	Module Type
CDPRE8	Purpose--›	GENERATE CS/ES TRANSFORM PROGRAM
	CDMACR	External routine
	CDP8A	Well-defined module
	CDPIC	External routine
	ERRPRO	External routine
	GENFIL	External routine
	OBINDN	External routine
	OCLOSE	External routine
	ODFINN	External routine
	OEXEC	External routine
	OFETCH	External routine
	OOPEN	External routine
	OSQL3	External routine
	RPTERR	External routine

3.10.8 Module Documentation

The following documentation describes information which is specific to each individual module being documented in this specification as listed in section 3.10.2. It provides a compact way of getting information that would be otherwise buried within each module's source code.

The specific items in this module documentation have the following meanings:

NAME:	Name of program Module.
PURPOSE:	Purpose of Module as detailed in the source code.
LANGUAGE:	Programming language source code is written in. The choices are: VAX-11 FORTRAN C (I/S-1 Workbench 'C') VAX-11 COBOL
MODULE TYPE:	Whether a Program, Subroutine, or Function.
SOURCE FILE:	Name of Source File from file specification.
SOURCE FILE TYPE:	Source File Extension from file specification.
HOST:	Whether this is a host-dependent routine (VAX or IBM) or blank if host-independent.
SUBSYSTEM:	IISS sub-system this file resides in.
SUBDIRECTORY:	Sub-directory of that subsystem in which this file resides.
DOCUMENTATION GROUP:	Name of documentation group of which this source file is a member.
DESCRIPTION:	A description of the module as otained from the source code.

ARGUMENTS:	The arguments with which this routine is called if it is a Subroutine or a Function.
INCLUDE FILES:	A list of all the files that are included into this module as well as their purposes.
ROUTINES CALLED:	Subroutines or Functions, either documented or external, called by this module, if any.
CALLED DIRECTLY BY:	The documented routines which call this module, if any.
USED IN MAIN PROGRAM(S):	The documented Main Programs which contain this module in their parts list according to the list in section 3.10.7.

The Module Documentation is arranged alphabetically according to Module Name.

GENERATE CS TO ES TRANSFORM Module Documentation

```
NAME:                   CDP8A
PURPOSE:                GENERATE THE EXTERNAL SCHEMA RECORD
                        DEFINITION
LANGUAGE:               VAX-11 COBOL
MODULE TYPE:            SUBROUTINE
SOURCE FILE:            CDP8A
SOURCE FILE TYPE:       .COB
HOST:
SUBSYSTEM:              CDM
SUBDIRECTORY:
DOCUMENTATION GROUP:    PS41253

DESCRIPTION:
------------
  -  THIS SUB PROGRAM WILL GENERATE THE
  EXTERNAL SCHEMA RECORD DESCRIPTION
  BASED ON ATTRIBUTES SET IN THE ES-ACTION-
  LIST.  THE CS-ACTION-LIST IS USED FOR THE
  CS-NDML-NO (NNN) IN THE ES VARIABLE
  WITH THE FORMAT ES-VAR-NNN-XX.
  -

ARGUMENTS:
----------
  CS-ACTION-LIST = RECRD
  ES-ACTION-LIST = RECRD
  FILE-NAME = DSPLY [X(30)]


INCLUDE FILES:
--------------
  ESREC       - WS DEFINTION FOR COBOL SOURCE LINE
  CSAL        - CONCEPTUAL SCHEMA ACTION LIST
  ESAL        - EXTERNAL SCHEMA ACTION LIST
  ERRPRO      - PROCESS ERROR INCLUDE FILE


ROUTINES CALLED:
----------------
  CDPIC
  ERRPRO
```

CALLED DIRECTLY BY:

CDPRE8 - GENERATE CS/ES TRANSFORM PROGRAM

USED IN MAIN PROGRAM(S):

CDPRE8 - GENERATE CS/ES TRANSFORM PROGRAM

GENERATE CS TO ES TRANSFORM Module Documentation

NAME: CDPRE8
PURPOSE: GENERATE CS/ES TRANSFORM PROGRAM
LANGUAGE: VAX-11 COBOL
MODULE TYPE: SUBROUTINE
SOURCE FILE: CDPRE8
SOURCE FILE TYPE: .COB
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY:
DOCUMENTATION GROUP: PS41253

DESCRIPTION:

THIS FUNCTION GENERATES SOURCE CODE WHICH, AT RUN-TIME, WILL TRANSFORM THE AGGREGATED CONCEPTUAL RESPONSE FROM THE AGGREGATOR CI TO THE REQUIRED EXTERNAL RESPONSE.

ARGUMENTS:

TARGET-HOST = DSPLY [XXX]
MY-HOST = DSPLY [XXX]
MOD-NAME = DSPLY [X(10)]
ES-ACTION-LIST = RECRD
CS-ACTION-LIST = RECRD
CE-WORK-LIST = RECRD
UV-ABBR-LIST = RECRD
ORACLE-LDA = RECRD
ERRFILE = DSPLY [X(30)]
GEN-FILE-NAME = DSPLY [X(30)]
RET-STATUS = DSPLY [X(5)]

INCLUDE FILES:

ESREC	- WS DEFINTION FOR COBOL SOURCE LINE
MACDAT	- WS VARIABLES FOR MACRO COPY UTILITY
SBSTLST	- WS DEFINITION FOR THE SUBSTITUTION LIST TABLE
ERRCDM	- IISS ERROR STATUS CODES FOR CDMP MODULES
CHKCDM	- IISS CDMP CHECK STATUS CODES
CSAL	- CONCEPTUAL SCHEMA ACTION LIST
ESAL	- EXTERNAL SCHEMA ACTION LIST
CEWORK	- CS TO ES WORK LIST INFORMATION

UVABBR - USER VIEW ABBREVIATION LIST
ORCLEDA - WS DEFINITION FOR THE ORACLE LOGIN AREA
ERRPRO - PROCESS ERROR INCLUDE FILE

ROUTINES CALLED:

GENFIL
OOPEN
OSQL3
ODFINN
OCLOSE
ERRPRO
RPTERR
CDPIC
OBINDN
OEXEC
OFETCH
CDMACR
CDP8A - GENERATE THE EXTERNAL SCHEMA RECORD DEFINITION

3.10.9 Include File Descriptions

The following list contains a purpose and description of each include file listed in 3.10.4 as specified in the source code. The language it is written in is also given.

GENERATE CS TO ES TRANSFORM Include File Description

FILE NAME: CEWORK
PURPOSE: CS TO ES WORK LIST INFORMATION
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

GENERATE CS TO ES TRANSFORM Include File Description

FILE NAME: CHKCDM
PURPOSE: IISS CDMP CHECK STATUS CODES
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

GENERATE CS TO ES TRANSFORM Include File Description

FILE NAME: CSAL
PURPOSE: CONCEPTUAL SCHEMA ACTION LIST
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

TABLE TO HOLD CONCEPTUAL DATA ABOUT THE REQUEST

***** THE CONCEPTUAL SCHEMA ACTION LIST

GENERATE CS TO ES TRANSFORM Include File Description

FILE NAME: ERRCDM
PURPOSE: IISS ERROR STATUS CODES FOR CDMP MODULES
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

CONTAINS ALL ERROR CODES USED BY CDMP *
MODULES FOR ERROR HANDLING *

GENERATE CS TO ES TRANSFORM Include File Description

FILE NAME: ERRPRO
PURPOSE: PROCESS ERROR INCLUDE FILE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

GENERATE CS TO ES TRANSFORM Include File Description

FILE NAME: ESAL
PURPOSE: EXTERNAL SCHEMA ACTION LIST
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

CONTAINS THE EXTERNAL SCHEMA INFORMATION FOR AN NDML REQUEST

THE EXTERNAL SCHEMA ACTION LIST

GENERATE CS TO ES TRANSFORM Include File Description

FILE NAME: ESREC
PURPOSE: WS DEFINTION FOR COBOL SOURCE LINE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

THIS DEFINITION IS USED WHEN GENERATING COBOL
SOURCE CODE

GENERATE CS TO ES TRANSFORM Include File Description

FILE NAME: MACDAT
PURPOSE: WS VARIABLES FOR MACRO COPY UTILITY
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

GENERATE CS TO ES TRANSFORM Include File Description

FILE NAME: ORCLEDA
PURPOSE: WS DEFINITION FOR THE ORACLE LOGIN AREA
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

THE ORACLE LOGON DATA AREA

GENERATE CS TO ES TRANSFORM Include File Description

FILE NAME: SBSTLST
PURPOSE: WS DEFINITION FOR THE SUBSTITUTION LIST TABLE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

SUBSTITUTION-LIST REPRESENTS THE INPUT TABLE
OF SUBSTITUTION PARAMETERS FOR THE CDMACR
MACRO EXPANSION SUBROUTINE

GENERATE CS TO ES TRANSFORM Include File Description

FILE NAME: UVABBR
PURPOSE: USER VIEW ABBREVIATION LIST
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

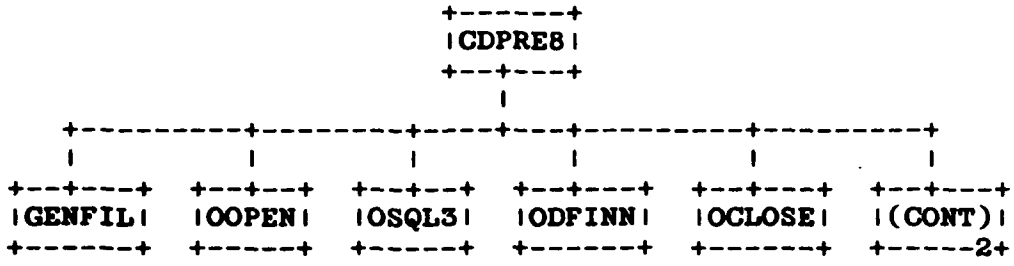
CONTAINS THE ABBREVIATIONS FOR ALL USER
VIEW REFERENCED IN THE NDML REQUEST

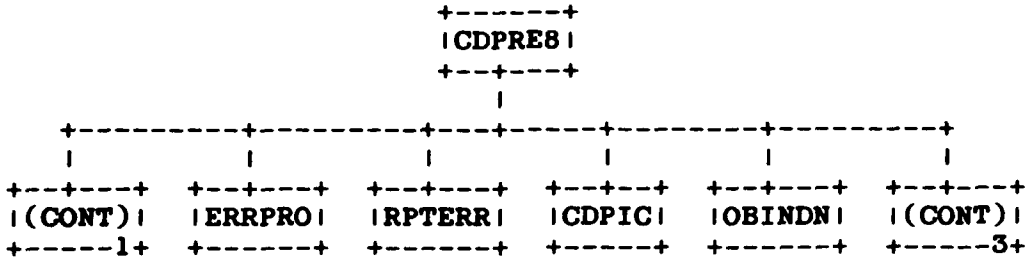
3.10.10 Hierarchy Chart

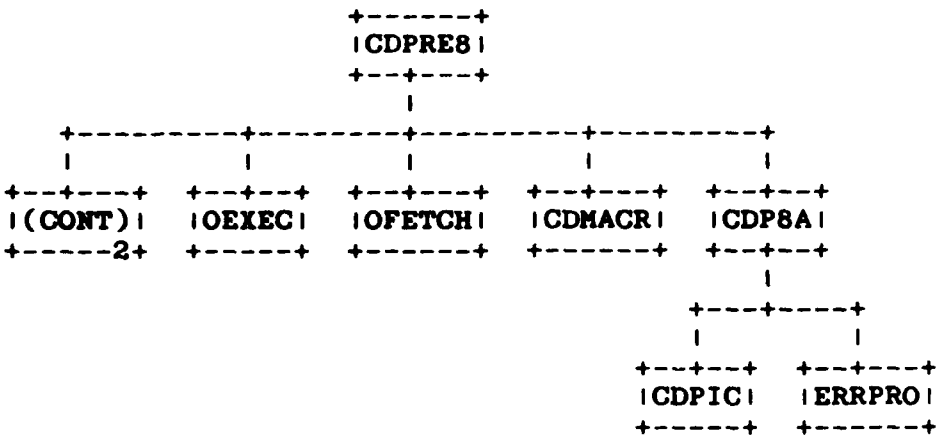
The following hierarchy charts show the relationships between all of the modules mentioned in the above documentation. A module may call a subroutine several times within its code, but the call will only be shown once as a single relationship on this hierarchy chart. All modules shown at the top of the first page are considered Main Programs as described in section 3.10.1 above.

There is an internal paging scheme as marked by the numbers in the upper right corner of each page. An index after the last page of the chart shows where a routine and its calls are first defined. If a routine has no page reference, it either makes no calls or is an external routine. A continuation box on the end of a tree limb shows where that the tree continues on the page numbered mentioned. A number in a box with a routine name points to the page where the routine is further defined within the hierarchy tree. If there is no number in a box, the routine either makes no calls or is an external routine.

1




CDPRE8
(CONT)
ERRPRO
RPTERR
CDPIC
OBINDN
(CONT)


CDPRE8
(CONT)2
OEXEC
OFETCH
CDMACR
CDP8A
CDPIC
ERRPRO

```
CDMACR
CDP8A.....3
CDPIC
CDPRE8....1
ERRPRO
GENFIL
OBINDN
OCLOSE
ODFINN
OEXEC
OFETCH
OOPEN
OSQL3
RPTERR
```

3.11 Program Listings Comments

This information is contained in the Module Descriptions in section 3.10.

SECTION 4

QUALITY ASSURANCE PROVISIONS

4.1 Introduction and Definitions

"Testing" is a systematic process that may be preplanned and explicitly stated. Test techniques and procedures may be defined in advance, and a sequence of test steps may be specified. "Debugging" is the process of isolation and correction of the cause of an error.

"Antibugging" is defined as the philosophy of writing programs in such a way as to make bugs less likely to occur and when they do occur, to make them more noticeable to the programmer and the user. In other words, as much error checking as is practical and possible in each routine should be performed.

4.2 Computer Programming Test and Evaluation

The quality assurance provisions for test consists of the normal testing techniques that are accomplished during the construction process. They consist of design and code walk-throughs, unit testing, and integration testing. These tests are performed by the design team. Structured design, design walk-through and the incorporation of "antibugging" facilitate this testing by exposing and addressing problem areas before they become coded "bugs."

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